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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/064,699	08/08/2002	Uway Tseng	9148-US-PA	9326

31561 7590 08/06/2003

JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE
7 FLOOR-1, NO. 100
ROOSEVELT ROAD, SECTION 2
TAIPEI, 100
TAIWAN

EXAMINER	
LE, THAO P	

ART UNIT	PAPER NUMBER
2818	

DATE MAILED: 08/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/064,699	Applicant(s) TSENG ET AL.	
	Examiner Thao P Le	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 August 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 August 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on 07/18/02 is acceptable.

Drawings

2. The drawings submitted on 08/08/02 are accepted by examiner.

Specification

3. The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

4. Claims 1-13 are pending.

Claim Rejections

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the

subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa et al., U.S. Patent No. 5,902,129, and further in view of Wieczorek et al., U.S. Patent No. 6,271,122.

Regarding to claims 1 and 8, Yoshikawa et al., referred as Yos thereafter, discloses the method of forming a cobalt silicide contact similar to what recited in claims 1 and 8. See Figs. 2-5 and Cols. 1-10. Yos discloses the method of forming the cobalt silicide contact in MOS structure comprising:

Forming a dielectric layer 8 on the silicon substrate 2,

Obtaining a contact opening between the dielectric layer 8 and stack structure 12,

Forming a silicon nitride spacer 13,

Forming a cobalt layer 20 in the opening wherein the cobalt layer 20 is in contact with the exposed silicon substrate portions 4,6,

Forming a titanium layer 30 on the cobalt layer by sputtering which is also known as ionized metal plasma (lines 6-7, Col. 5),

Forming a titanium nitride layer 40 on the titanium layer 30 by reactive sputtering (lines 9-10, Col. 5),

Performing a first rapid thermal process to induce a reaction between the cobalt layer and the silicon substrate to form a cobalt silicide layer (Fig. 5),

Removing the unreacted cobalt, titanium, and titanium nitride using wet etching technique (Fig. 5; lines 60-61, Col. 5),

Performing a second rapid thermal process (lines 1-5, Col. 6),

However, Yoshikawa et al. fails to disclose the steps of forming the opening within the dielectric layer and later filling the contact opening with a conductive layer after performing the second rapid thermal process. Wieczoreck et al. discloses the method of forming a structure similar to present invention's structure comprising the step forming a contact opening 102 (Fig. 2A) within the dielectric layer 119 before forming the cobalt silicide layer 115 in the contact opening. Wieczorek et al. also discloses further step of filling the opening with conductive layer such as tungsten into the opening after forming the cobalt silicide layer. It would have been obvious to one having skill in the art at the time the invention was made to form an opening within the dielectric while practicing Yoshikawa et al.'s method if one were making a device like that of Wieczorek et al.'s because Yoshikawa et al. suggests that his method is applied to a variety of devices such as MOS, and interconnect structures for contact, conduction, and connections between the various components of the devices and Wieczorek et al.'s device is an interconnect device.

Still regarding to claim 8, both Yoshikawa et al. and Wieczorek et al. fail to disclose the aspect ratio of the contact opening is greater than 10. The aspect ratio is greater than 10 is considered as high aspect ratio. It would have been obvious to one having skill in the art that the continuing trends toward high-density devices require the formation of high aspect ratio contact opening.

Still regarding to claim 8, Wieczorek et al. discloses further step of performing a chemical mechanical polishing process to removed portions of the conductive layer or excess material formed above or outside of the opening (lines 58-59, Col. 5).

Regarding to claim 2, Yoshikawa et al. discloses the limitation recited in claim 2 wherein the first rapid thermal process is performed at a temperature of about 500 to 600 degrees Celsius (lines 25-26, Col. 5).

Regarding to claims 3 and 9, both Yoshikawa et al. and Wieczorek et al. disclose the RTA process is performed in the present of nitrogen gas.

Regarding to claim 4, Yoshikawa et al. discloses the limitation recited in claim 4 wherein the second rapid thermal process is performed at a temperature of about 700 degrees Celsius (lines 3-4, Col. 6).

Regarding to claims 5 and 10, Yoshikawa et al. disclose the formation of titanium using ionized metal plasma (or sputtering) but fail to disclose the step coverage of the ionized metal plasma titanium layer is about 50%. However, it would have been obvious to one having skill in the art that the optimum deposition parameter can be

determined in a particular situation depending upon intentionally the amount of the titanium and the thickness of the titanium layer.

Regarding to claims 6 and 11, Wieczorek et al. further discloses that the conductive layer filled in the contact opening comprises tungsten (line 54, Col. 5).

Regarding to claim 12, Wieczorek et al. discloses the method in claim 11 wherein performing the chemical mechanical process comprises performing a tungsten chemical mechanical process (line 58, Col. 5).

Regarding to claims 7 and 13, Wieczorek discloses the filling of tungsten into the contact opening but fails to disclose the filling performed at a temperature of about 400 to 450 degrees Celsius. It is well known in the art that the selection of temperature parameters would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in **temperature, or others such as time, molar fraction, depth, thickness, concentration etc.**, or in conbination of the parameters would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).*

Moreover, the temperature for filling the contact opening with the conductive layer has not been alleged by applicant to be of significant importance to be patentability.

7. If Applicants are aware of better art than that which has been cited, they are required to call such to attention of the examiner.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao P. Le whose telephone number is 703-605-1187. The examiner can normally be reached on Monday-Thursday 7:30am-6: 30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 703-308-4910. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Thao Phuong Le

Examiner

HOAI HO
PRIMARY EXAMINER